After the Breakthrough: Worst-Case Civilizational Failure from a Global Cryptography Collapse

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This paper chronicles, without prescribing remedies, the cascading consequences of a sudden cryptography collapse triggered by a breakthrough that renders public-key systems, symmetric ciphers, hashes, MACs, signatures, timestamps, and code-signing effectively forgeable or decryptable at practical cost. We assume simultaneous geopolitical escalation and large-scale workforce absenteeism. Past communications become readable; live control channels are spoofable; software authenticity is indistinguishable from theater. Markets seize as authentication and price discovery fail; transport halts on forged clearances and sabotage fears; supply chains fracture, producing fuel, water-treatment chemical, and medical cold-chain shortages. Scarcity converts quickly to coercion: ration lines replace price boards, protection rackets proliferate, borders harden, and legitimacy fragments as counterfeit decrees circulate. Public health deteriorates under utility outages, waste backlogs, and crowding; hospitals overflow while records are contestable. Information ecologies degrade into rumor, deepfake leadership, and retaliatory myth. Infrastructure attrits by theft and misoperation; recovery paths close as spares are exhausted and assets are cannibalized. By Year 1, de facto city-state islands, rural enclaves, and failed corridors emerge with parallel currencies tied to food, fuel, and force. The term cryptography collapse is used throughout as the root cause that couples digital failure to physical scarcity, violence, and institutional amnesia.

Keywords: cryptography collapse, breakthrough attack, cascading failure, wartime fragmentation, market seizure, supply chain fracture, waterborne disease, legitimacy crisis, displacement, atrocity dynamics.

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1) Definition and Premise: The Breakthrough and the Cryptography Collapse

This paper treats a single triggering event: a breakthrough that renders contemporary cryptography ineffective at practical cost. “Cryptography collapse” means public-key systems (RSA, ECC, pairings), symmetric ciphers (AES families, stream ciphers), hashes and MACs (SHA-2/3, HMAC, Merkle trees), signatures, timestamps, and code-signing are all forgeable or decryptable with commodity-scale resources. The effect is both retroactive and live. Archives of captured traffic are now plain text; current sessions are malleable in real time. Authenticity becomes indistinguishable from theater: every binary, certificate, token, or log can be fabricated with artifacts that pass formerly definitive checks. The collapse is not localized to a protocol or vendor; it is substrate-level. It couples immediately to geopolitics and labor because modern logistics, finance, utilities, and command structures assume cryptographic truth as a background constant.

1.1 Universal, practical breaks (retroactive + live)

- **Retroactive decryption:** Decades of stored TLS, VPN, satellite, and radio captures become readable. Corporate M&A rooms, diplomatic cables, medical archives, source-code repositories, and password vault exports leak in bulk. Past “proofs” of authorship, delivery, or consent lose probative value because their signatures and timestamps are reproducible by anyone.
- **Live forgery and manipulation:** In-flight sessions are downgraded or replaced. Firmware “updates,” package feeds, container images, and CI artifacts appear valid under collapsed signatures. Payment instructions, custody transfers, notarizations, and control messages are trivially spoofed. Attackers can originate or edit messages that verify under old rules, erasing the distinction between genuine and counterfeit.
- **Hash/commitment failure:** Content addressing, deduplication, and Merkle structures no longer anchor identity or history. Transaction IDs, logs, backups, and chain-of-custody records can be re-minted with alternate contents that still “match.” For systems that depended on collision or preimage resistance as a bedrock, integrity reduces to a claim without a referee.
- **Systemic coupling:** Because confidentiality, integrity, and authenticity all fail simultaneously, failures compound: stolen secrets accelerate live attacks; live forgeries poison the logs meant to diagnose them; poisoned logs then justify further false actions.

1.2 Indistinguishable software and orders; counterfeit timestamps and seals

- **Software authenticity collapse:** Binaries, drivers, OTA packages, mobile apps, and OS updates arrive with perfect-looking signatures and reproducible build attestations. There is no procedural way, within the system, to tell a legitimate hotfix from a kill-switch. Vendors cannot prove identity to customers; customers cannot prove a safe roll-back to vendors.
- **Operational command fog:** Orders to open dams, halt trains, divert tankers, or shed electrical load are broadcast with valid-looking credentials. Conflicting orders proliferate; some are malicious, some are protective, none can be cryptographically privileged. Human operators face mutually exclusive commands bearing identical "proofs."
- **Time becomes plastic:** Timestamps, countersignatures, and audit trails are recomputed to match any narrative. "Before vs after," "first vs second," and "copy vs original" lose determinacy in digital form. Courts, regulators, and insurers receive dossiers that are internally consistent yet mutually contradictory, each bearing seals that formerly settled disputes.
- **Physical tokens devalued by digital twins:** Embossed certificates, QR-tagged seals, NFC badges, and printed barcodes all map back to databases and signing keys that no longer separate true from false. Mass production of counterfeit identity, permits, and bills of lading saturates checkpoints and warehouses, overwhelming manual inspection capacity.

1.3 Concurrent war onset and workforce absenteeism

- **Escalation window:** Adversarial states and non-state actors exploit the authentication void to trigger incidents that look like enemy action: forged mobilization orders, falsified radar tracks, spurious missile alerts, and sabotage claims. Border closures, curfews, and emergency decrees arrive within days, sometimes hours.
- **Labor collapse (30–70% absenteeism bands):** Critical staff do not report due to fear, flight, family care, conscription, blockade, or coercion. Absences are uneven: some plants lose entire specialties (e.g., control-room operators, riggers, welders, linemen). Training pipelines cannot fill the gap; cross-skilling is too slow relative to the shock.
- **Contested corridors:** With war onset and forged clearances, air, rail, and maritime movements stall. Drivers refuse high-risk routes; insurers withdraw coverage; ports jam as paperwork becomes untrustworthy. Local shortages emerge even where physical stock exists.

- **Authority fragmentation:** Multiple actors claim command: central ministries, regional governors, militias, corporate security, foreign "advisers." Each issues orders bearing credible but counterfeit seals. On the ground, compliance correlates with proximity and force, not legitimacy.
- **Feedback into collapse:** War amplifies the cryptography collapse by increasing demand for trusted communications precisely when none exist; absenteeism amplifies both by removing the human redundancy that could have substituted for broken automation. The combined effect is a fast drift from technical incident to societal fracture.

2) Hour 0–24: Authentication Void and Market Freeze

The first day is defined by the sudden absence of a referee. Systems that depended on cryptographic proofs to decide **who** may speak and **what** counts as a fact find themselves unable to make either determination. The consequence is not merely hesitation but paralysis: the safest action is often to do nothing. Across networks and trading floors, "fail closed" becomes the ambient state.

2.1 Trading halts, bank runs, cash hoarding

- **Exchange circuit-breakers trip and stay tripped.**
  Matching engines and clearinghouses receive irrevocable-looking cancel/replace floods and forged custody transfers bearing perfect credentials. With no way to privilege one order stream over another, venues suspend continuous trading. Indices lose price-discovery anchors; ETFs and derivatives gap away from any believable NAV.
- **Settlement counterparties freeze instructions.**
  SWIFT/ACH/SEPA messages arrive with conflicting signatures; custodial sub-ledgers disagree with central depositories; triparty agents see collateral substitutions that validate under collapsed checks. Back offices stop netting; same-day settlement collapses into "await manual review," which cannot occur at machine speeds.
- **Retail interfaces fracture.**
  Mobile banking and brokerage apps present normal balances one moment and "service temporarily unavailable" the next. Push alerts and emails—indistinguishable from spoofs—announce security reviews, fueling uncertainty. Branch queues form as rumor outpaces official statements.

- **Flight to bearer instruments.**
  Individuals and firms attempt to convert deposits into physical cash, bullion, cashier's checks, and anything with locality and possession. ATMs rate-limit and empty; armored couriers face ambush rumors; central banks hesitate to flood notes without a distribution channel they trust.

- **Price signals vanish; spreads explode where trading persists.**
  Without authenticated quotes and confirmable trade reports, the concept of "mid" dissolves. Where OTC persists among known humans, bid–ask spreads become defensive—dozens of percentage points—reflecting verification costs and settlement risk rather than underlying asset uncertainty.

- **Shadow banking stresses surface.**
  Repo desks refuse collateral they cannot definitively title; money-market funds gate withdrawals; commercial paper windows close. Firms reliant on rolling short-term liabilities face immediate insolvency **on paper**, even if warehouses are full—because paper is what no longer resolves.

2.2 Code-signing collapse; vendor silence; update streams weaponized

- **Authenticity of software becomes undecidable.**
  Operating systems, hypervisors, browsers, and device firmware typically anchor trust in a web of signatures and transparency logs. In the first hours, "critical update available" coexists with "do not update" rumors. Both messages carry valid-looking proofs. Operators can neither accept nor reject with confidence.

- **Vendors go publicly silent.**
  Corporate feeds and status pages—now indistinguishable from fakes—cease posting to avoid being hijacked as attack vectors. Press offices halt email advisories; security teams avoid publishing indicators that could be counterfeited and turned into lures. The absence of authoritative speech is read as confirmation of catastrophe.

- **Package ecosystems invert.**
  Language registries and container repositories continue serving artifacts whose signatures verify under collapsed primitives. Malicious maintainers (or their impersonators) push "hotfixes" that comply with every former gate. Reproducible-build attestations and SBOMs are forged at scale, turning due diligence into camouflage.

- **Supply chains turn inside-out.**
  OEMs receive "urgent" firmware from their Tier-1s; Tier-1s receive "urgent" microcode

from the fabs; fabs receive “urgent” mask updates from “design partners”—all plausibly signed, all potentially weaponized. No link in the chain can assert provenance that others may trust; production lines pause to avoid bricking devices en masse.

- **Device fleets drift into ambiguity.**
  Consumer phones, routers, point-of-sale terminals, and industrial controllers present update prompts with perfect seals. Some owners accept, some defer. Within hours, the same model exists in mutually incompatible states: some compromised, some merely outdated, none provably safe. Fleet heterogeneity becomes unmeasurable risk.
- **Incident response loses the notion of “known-good.”**
  Gold images, forensic tools, and rescue media all depend on signatures and checksums to establish baseline truth. With those gone, responders cannot assert that their own instruments are untainted. “Re-image” and “roll back” lose meaning when binaries and hashes can be fabricated to match any chosen past.
- **Communications channels become lures.**
  Status emails, RSS advisories, signed blog posts, PGP-verified lists—every historically safe pathway now provides an attacker with a perfect impersonation surface. The safer course is silence; silence amplifies rumor; rumor triggers erratic patching; erratic patching produces outages indistinguishable from compromise.

In these first 24 hours, markets freeze because messages cannot be authenticated, and machines drift because updates cannot be trusted. The two reinforce each other: capital cannot move to repair outages, and outages prevent the speech needed to restart capital. The defining feature of the window is not damage but doubt—so pervasive that action itself becomes an unacceptable form of risk.

3) Days 2–7: Supply Chains Fracture Under the Cryptography Collapse

The second through seventh days convert informational paralysis into physical scarcity. Authentication voids at customs, terminals, and depots turn routine handoffs into disputes; operators choose idleness over irreversible mistakes. Stock exists but is stranded behind paperwork that no longer settles who owns what, who may move it, or where it may go.

3.1 Fuel interdictions; chlorine shortages; cold-chain failure

- **Refineries and terminals stall on forged nominations.**
  Liftings arrive with perfect-looking credentials from “counterparties” that may not exist.

Terminal operators suspend truck rack access and pipeline batches to avoid misdelivery claims. Jet A and diesel allocations lapse; priority draws cannot be verified.

- **Pipeline and metering disputes.**
  SCADA setpoints and batch IDs are spoofable; custody transfer meters and tank gauging systems produce logs no one trusts. Upstream and downstream parties refuse to book throughput without human witnessing, which does not scale.
- **Retail knock-on:**
  Urban stations run dry first (high churn); rural sites keep fuel but decline cards and fleet tokens that can't be authenticated. Police, ambulance, and generator fleets begin rationing, creating uneven coverage maps.
- **Chlorine and coagulant shortages.**
  Water plants with a week of chemicals immediately enter conservation after counterfeit bills of lading appear at gates. Railcars held for verification accumulate in yards; hazmat escorts are withheld. Jar tests degrade as alum/PACl deliveries slip; residuals drift.
- **Cold-chain failure modes.**
  Without authenticated work orders, refrigerated trailers are left unplugged at yards; drivers refuse to break seals whose documentation could be counterfeit; dry ice replenishment misses rounds. Vaccines, insulin, certain antibiotics, and blood products exceed temperature excursions; discard rates spike.
- **Coupling and feedback:**
  Fuel scarcity raises missed shifts and longer generator run times, further depleting fuel; chlorine scarcity degrades potable water just as hospitals face more GI illness; cold-chain failure drives urgent resupply requests that logistics cannot service.

3.2 Warehouse theft, convoy abandonment, port congestion

- **Paperwork noise saturates gates.**
  Forklifts sit while managers face stacks of indistinguishable pick tickets and release orders. With liability unclear, warehouses adopt "hold until clarified," swelling yard inventory without outbound relief.
- **Shrink and predation.**
  Guard forces thin; insiders collude; trucks leave with mixed loads under fabricated manifests. Loss prevention can neither prove nor disprove theft—camera systems log to tamperable storage; seal numbers match counterfeit ledgers.

- **Convoy risk calculus flips.**
  Drivers see spoofed route changes and fake police inspections. Rumors of ambushes and cargo seizures proliferate. Insurance is suspended; carriers declare force majeure. Many loads are **abandoned in place** at rest areas and fringes of cities rather than risk contested corridors.

- **Port and rail gridlock.**
  Berths fill with vessels whose discharge orders are disputed; customs and terminal operating systems cannot distinguish legitimate entries; containers stack in yards while reefer plugs are over-subscribed. Rail heads stop accepting intermodal units without verified waybills, backing congestion into port gates.

- **Modal substitution fails.**
  Attempts to shift to air cargo encounter the same credential problem: forged airway bills, spoofed slot allocations, and uncertain hazmat declarations. Airfields impose blanket embargos rather than accept liability.

- **Self-reinforcing congestion:**
  As dwell times climb, labor productivity falls (crowded yards, search time for units); as productivity falls, dwell increases further. Theft rises with dwell, pushing operators to close yards entirely—removing remaining throughput.

3.3 Hospital overflow and critical drug stock-outs

- **Volume and acuity rise together.**
  Accidents from dark intersections, generator failures during surgery, dehydration from water advisories, and violence injuries increase ED arrivals. Simultaneously, outpatient clinics close for lack of verified EHR access, shifting their load to hospitals.

- **Information collapse at the bedside.**
  Medication verification, transfusion matching, imaging uploads, and telemetry feeds rely on digital signatures and timestamps. With those untrustworthy, clinicians default to paper and human checks, slowing throughput while error risk rises.

- **Pharmacy bottlenecks.**
  Wholesalers cannot authenticate orders; controlled-substance pedigrees are forgeable; diversion risk skyrockets. Automated dispensing cabinets fall back to local overrides with printed logs—consumption increases while replenishment stalls.

- **Early stock-outs (order-of-appearance):**
  Insulin (cold-chain), pediatric liquid formulations, broad-spectrum antibiotics

(ceftriaxone/piperacillin-tazobactam), dialysis consumables (filters, bicarbonate), IV fluids (NS/LR), and sedatives/analgesics used for trauma care. Oxygen manifold swaps slow due to staffing; portable cylinders go missing.

- **Boarding and spillover.**
  Inpatient beds fill; EDs board admits; ambulance off-load delays stretch hours. "Hospital full" diversions push patients to facilities facing the same constraints. Mortality rises not only from severity but from **time spent waiting**.
- **Secondary health effects.**
  Interrupted chemotherapy and dialysis schedules; missed prenatal visits; unmanaged chronic conditions (asthma, CHF) worsen. Psychiatric decompensation increases ED holds and security incidents.
- **Feedback into supply chains:**
  Hospitals request emergency resupply "at any cost," but cannot prove identity or receipt; counterfeit relief shipments appear; genuine drivers refuse chaotic docks. The facility becomes both a victim and an amplifier of the wider logistics failure.

Days 2–7 define the inflection: stock exists, but authentication does not. Movement decisions revert to proximity, force, and rumor. Scarcity ceases to be hypothetical and begins to restructure behavior.

4) Weeks 2–4: Utilities and Public Health Unravel

By the third and fourth weeks, scarcity stops being a logistics problem and becomes an ambient condition. The **cryptography collapse** continues to prevent authenticated dispatches, work orders, and alarms; staffing remains thin; and small errors compound into regional failures. What began as "rolling" interruptions hardens into **persistent absence** of services. Health signals move from clinics to cemeteries.

4.1 Water interruptions; unmet boil notices; diarrheal outbreaks

- **Production falters into patterned absence.**
  Treatment plants cycle unpredictably: some run dry for lack of verified chemical deliveries; others throttle because intake screens clog and telemetry can't be trusted. Reservoir levels drift without credible SCADA, forcing conservative shutdowns. Neighborhoods learn informal schedules—midnight flow, afternoon silence.

- **Advisories that cannot land.**
  "Boil water" and "do not drink" notices circulate as flyers, radio rumors, and counterfeit bulletins indistinguishable from real ones. Many households either never hear them or distrust them. Compliance is uneven; fuel scarcity makes boiling impractical even for the informed.

- **Quality variance becomes invisible.**
  With lab chains-of-custody contestable, bacteriological and residual chlorine results lose authority. Operators rely on crude jar tests and smell/taste heuristics; consumers cannot distinguish clean from contaminated taps. Private wells see opportunistic use without testing.

- **Disease curves steepen.**
  Acute watery diarrhea rises first in dense districts and informal camps, then radiates outward. Pediatric dehydration admissions increase; oral rehydration salts run short; cholera and other enteric pathogens find conditions favorable where sewage and water lines co-mingle under low pressure.

- **Knock-on morbidity.**
  GI illness removes remaining workers from shifts; caregivers abandon queuing for ration lines to tend to sick children; clinics face staff infections. The water problem compounds itself.

4.2 Waste backlog; vector-borne disease rise

- **Garbage becomes geography.**
  Missed pickups stack into windrows along curbs and alleys; transfer stations choke on disputed tipping tickets; already-thin collection crews avoid blocks where violence and extortion are reported. Burning trash provides temporary clearance and persistent smoke.

- **Sewage out of containment.**
  Lift stations without trusted remote control stall; wet wells overflow into streets and basements. Combined sewer overflows turn storm events into contamination pulses. Manholes are propped open to "relieve pressure," spreading fecal slurry along low-lying corridors.

- **Vector niches multiply.**
  Stagnant water accumulates in clogged drains, tire piles, and flooded basements; mosquito breeding surges by week three. Rats track along garbage lines and open

sewers. Flea and mosquito complaints replace power-outage calls as the most common neighborhood radio traffic.

- **Epidemiology tilts.**
  Diarrheal diseases are joined by **leptospirosis** (flooded rat urine paths), **dengue/chikungunya** (standing water), and **typhus** in crowded camps. With labs untrusted and reagents short, diagnoses become clinical, and surveillance degrades to rumor heat maps.

- **Public space redefined.**
  Parks and school yards become waste spillover zones; improvised dumps appear near food lines; carcass disposal lags. The line between "residential" and "dump" blurs in peripheral neighborhoods.

4.3 Rolling blackouts become black regions; equipment loss

- **From schedule to silence.**
  Load-shedding calendars slip as crew absences, fuel scarcity for peakers, and unverified dispatch orders accumulate. By week three, entire feeders go dark for days; some substations are de-energized indefinitely after protection trips that no one is confident reversing.

- **Protection without provenance.**
  Relays that once tripped with cryptographically attested events now present ambiguous fault histories; operators treat "unknowns" as hazards and leave circuits cold. Lines remain de-energized after hypothetical faults to avoid cascading failures.

- **Hardware attrition begins to bite.**
  Transformers overheat under irregular loading; cooling fans fail without spares; bushings flash over after contaminated rains. Theft accelerates: copper grounds, control wiring, and even transformer oil disappear. Cannibalization to keep "priority" circuits alive dooms peripheral nodes.

- **Islanding turns into isolation.**
  Microgrids that held for a week—around hospitals, water plants, and telecom towers—exhaust diesel, lose inverter sync, or suffer controller ambiguity. Some islands stay up under ad hoc rules; others blink out and do not return.

- **Domestic life reorders.**
  Refrigeration becomes unreliable across wide areas; food spoilage accelerates; nighttime

security erodes; battery charging windows shrink. Informal markets trade in candles, charcoal, and scavenged generator parts; fire incidents rise with indoor combustion.

- **Feedback into health and logistics.**
  Dark corridors deter convoys; hospitals on dwindling generator reserves triage more aggressively; vaccine and insulin losses worsen. The distinction between an "outage" and a **region that no longer has power** disappears from practical speech.

Across Weeks 2–4, utilities cease to be episodically unreliable and become **structurally absent** in expanding zones. Public health follows the geometry of that absence: first advisories, then illness, finally new baselines of disease and mortality that feel normal because they are persistent.

5) Security Spiral and Informal Violence

As utilities and markets fail, coercion substitutes for adjudication. Authority migrates from institutions to whoever can field men, weapons, and vehicles. What began as scattered opportunism settles into patterned extraction and selective terror, reinforced by the **cryptography collapse**: no one can prove an order is false, so every threat can claim patronage.

5.1 Looting, protection rackets, and armed checkpoints

- **From smash-and-grab to taxation by gun.**
  The first wave is impulsive looting at darkened retail and depots. Within days, crews standardize routes, timings, and lookouts. A second layer emerges: "protection" collectors who present stamped slips and counterfeit municipal seals demanding security fees from shops, clinics, and apartment blocks.

- **Checkpoint proliferation.**
  Road junctions, bridges, and approaches to railheads acquire improvised barriers. Control shifts hourly between police detachments, militia cells, and opportunists. Each checkpoint posts its own "papers"—movement passes, cargo permits, curfew waivers—printed from templates that mimic prior government forms.

- **Commodity taxation and corridor tolls.**
  High-value flows—fuel, pharmaceuticals, meat—attract repeat ambushes unless a toll is paid. Tolls take the form of skimmed cargo, cash, or conscription of drivers as "escorts."

Receipts are issued with convincing seals that cannot be externally validated, allowing rival factions to double-tax the same movement.

- **Territorial branding.**
  Groups mark neighborhoods with paint, flags, and radio call signs. Residents learn the local vernacular to pass street quizzes. Mispronunciation or the wrong story results in beatings, confiscation, or disappearance.

- **Private security blurred into militia.**
  Corporate guards and neighborhood watches escalate armament and remit to local strongmen for deconfliction. Contracts are oral, renewed daily; uniforms lose meaning; chain of command is proximity and fear.

5.2 Refugee flows meet hardened borders; camp degradation

- **Interlocking flight paths.**
  Families flee dark districts toward rumored "safe" towns, while rural households head toward city hospitals. Columns intersect at roadblocks and contested choke points, creating immobile masses that become markets for extortion and recruitment.

- **Hard borders, soft law.**
  Provincial lines and city limits act like international frontiers: passes required, inspection queues measured in days, bribery normalized. Admissions criteria change by hour—"locals only," "women and children first," "workers with skills"—enforced by guards brandishing forged decrees.

- **Camp formation as sediment.**
  Where movement halts, camps congeal: parking lots, stadiums, median strips. Latrines lag; water lines fail; trash mounts. Aid signs appear, many counterfeit: "Food distribution 1600," "Vaccination here," funneling crowds for shakedowns or propaganda.

- **Social order inversion.**
  Informal leaders—gang lieutenants, charismatic preachers, former officials—compete to allocate tents, queue positions, and favors. Transaction costs are sexual exploitation, conscription of teenage boys, or "volunteer" labor for local militias.

- **Epidemiologic and protection overlap.**
  Measles, diarrhea, and lice infestations spread alongside gender-based violence and child abductions. Curfew horns sound each dusk; night patrols "disappear" those accused of theft or rumor-mongering. Witnesses have nowhere authoritative to report: records, if taken, are easily fabricated.

5.3 Assassinations and disappearances under forged orders

- **Paper as weapon.**
  Hit lists circulate as “official warrants” bearing impeccable seals. Targets include utility foremen, port schedulers, pharmacists, union heads, journalists, and pastors—anyone seen as controlling scarce resources or narratives. Credible-looking arrest papers provide cover for kidnappings and killings.

- **Selective terror to seize nodes.**
  A dozen murders in a week flip control of a water plant, substation yard, or wholesale market. Replacement managers accept protection to survive; their signatures then legitimate the new order—on paper, the transition looks procedural.

- **Night-time detentions.**
  Vans without plates sweep at curfew; neighbors wake to doors splintered and bodies bundled. Families receive contradictory notices: “detained for questioning,” “transferred,” “released”—none verifiable. Bodies appear later in drainage canals or not at all.

- **Rumor as targeting system.**
  Deepfaked audio and doctored chat logs circulate naming “saboteurs” and “hoarders.” The accused are dragged from queues or pulled off buses by ad hoc tribunals. False confessions, staged videos, and forged “confession letters” cement narratives after the fact.

- **Impunity by ambiguity.**
  With provenance dead, perpetrators attribute actions to rival factions; rivals blame “foreign agents.” Death tallies become political instruments; lists of the missing are inflated, deflated, duplicated—none authoritative, all emotionally potent.

Across this phase, violence regularizes into extractive governance without law. The cryptography collapse enables it by erasing provenance: every shakedown can claim a seal, every murder an order, every camp a mandate. What counts is not truth but who can produce the most convincing paperwork at gunpoint—and hold the intersection long enough to enforce it.

6) Governance Fracture and Legitimacy Contests

The **cryptography collapse** removes the referee that once separated a lawful order from a forgery. Authority loses its monopoly on authentic speech; governance atomizes into whatever can be enforced locally with convincing paperwork and force.

6.1 Counterfeit decrees; municipal splintering; parallel authorities

- **Decree inflation.**
  City halls, ministries, police commands, and "transitional councils" all issue bulletins on identical letterheads with perfect seals: curfews, requisitions, ration rules, movement permits. Each circular contradicts another; all are unrefutable because provenance is dead.

- **Administrative drift.**
  Departments fracture along personal networks. Water, sanitation, power, and public works managers obey whoever secures their sites, not whoever signs the memo. Payrolls and rosters split; two people claim the same job; both present documents.

- **Municipal balkanization.**
  Neighborhoods form "committees" that collect trash, guard wells, and run food lines under their own stamps. Adjacent committees declare each other illegitimate. City maps gain new borders: parish lines, gang lines, business-improvement-district militias, union halls, and church precincts—all issuing passes.

- **Layer-cake sovereignty.**
  A provincial governor, a metropolitan mayor, a police commissioner, and a militia commander each claim jurisdiction over the same port. Dockworkers choose the one standing on the quay with armed men and fuel. The others continue to publish edicts to audiences that cannot verify them.

- **Signal without source.**
  Radio nets, loudhailers, and printed broadsides are saturated with orders. People follow the voice they recognize in person, not the seal printed at the bottom.

6.2 Courts inoperative; property/identity records contested

- **Procedural collapse.**
  Courts cannot validate filings, service of process, or custody of evidence. Dockets freeze;

emergency chambers are overwhelmed by forged injunctions and competing restraining orders bearing identical provenance. Judges retreat; clerks stop stamping.

- **Land and title confusion.**
  Deeds, liens, and mortgages are duplicated with backdated timestamps that verify under the old regime. Two families, two banks, and a militia show up with papers for the same building. Evictions are carried out by whoever arrives first with a truck and men.

- **Corporate personhood becomes oral.**
  Boards split; "minutes" appear from both factions; wire instructions and shareholder registers are printable by anyone. Factories open under hostile management who present notarized-looking transfers; the old management arrives later with an equally convincing set.

- **Identity without anchor.**
  Driver's licenses, passports, academic and medical records exist in sets: originals, scanned "copies," and cloned versions with swapped photos. Employers and aid agencies fall back to witness statements and lists kept by local notables; these lists become instruments of exclusion.

- **Evidentiary nihilism.**
  Video, logs, emails, and "secure" messages are mutually inconsistent yet internally coherent. In the absence of a trusted chain, facts become allegiance. Trials, when they occur, are theater for the faction that controls the room.

6.3 Warlords, militias, and corporate guards as de facto rulers

- **Extraction replaces taxation.**
  Road tolls, protection payments, and "security retainers" fund governance. Receipts bear seals that look official; compliance is measured in trucks allowed through and nights without raids, not in legal standing.

- **Portfolio rule.**
  Different actors manage different functions: a militia runs checkpoints, a church group runs kitchens, a corporate guard force runs the port, and a "civic committee" allocates housing. None report to the others; all claim the city's crest.

- **Recruitment through necessity.**
  Food, water, and safe passage are tied to enrollment. Teenage boys become "auxiliaries" to get rations; skilled workers receive movement passes in exchange for service. The line between public employment and conscription dissolves.

- **Brand management of force.**
  Warlords publish codes of conduct and dispute boards to appear legitimate; corporate security adopts uniforms and “ombudsmen”; militias stage town-halls. Each performs statehood while maintaining coercive leverage.
- **Violence as appellate court.**
  When two stamped orders conflict, the ruling is whoever can enforce it at the gate, the depot, or the clinic. Precedent is memory plus muscle. Maps update not by law but by last night’s skirmish.
- **International varnish.**
  External actors (NGOs, foreign consulates, neighboring states) pick interlocutors pragmatically to move aid or protect assets. Recognition—once a legal act—becomes transactional: a photo op, a signed (forged) memorandum, a convoy delivered.

By this phase, “government” is a plural noun. The cryptography collapse ensures that every edict can be perfectly faked; war and scarcity ensure that some edicts will be violently enforced. Legitimacy detaches from documents and reattaches to proximity, continuity, and coercive capacity.

7) Monetary and Trade Breakdown

With cryptographic trust gone, money loses its memory. Titles, balances, wire instructions, invoices—anything that once settled “who owes whom” becomes a contestable story. Exchange retracts to whatever can be inspected by hand and defended on the spot.

7.1 Barter and commodity scrip; ration lines replace markets

- **Ledger amnesia.**
  Bank cores, payment processors, and ERPs present reconcilable-looking but mutually incompatible states. No statement is final; every receipt is printable. Credit evaporates because debt cannot be proven—or disproven—beyond the room where it’s argued.
- **Reversion to tangibles.**
  Trade shifts to fuel, food, medicine, batteries, blades, and labor-hours. Denominations become physical: liters, kilos, cartons, shift-blocks. Value is priced in **distance and risk**, not currency.

- **Ad hoc scrip.**
  Mines, mills, municipalities, and militias issue stamped chits—meal tickets, "fuel rights," shift tokens—redeemable at their own depots. The promise is proximity: the issuer controls the gate today. Tomorrow is a rumor.

- **Queue economics.**
  Vendor stalls thin; price boards freeze; lines lengthen into **ration geometries** policed by whoever commands the corner. Where cash persists, it acts as a priority bribe, not a medium of account.

- **Shrinking baskets.**
  Pack sizes fall; substitutes proliferate; adulteration rises. "Family packs" become single-use; infant formula is stretched; bread is bulked with filler. Sellers weigh with suspect scales; buyers carry their own.

- **Wage inversion.**
  Salaries arrive as scrip redeemable for staples, or not at all. Skilled workers accept food plus a pass through checkpoints; professionals barter services for antibiotics and generator time.

7.2 Export bans and strategic hoarding; maritime standstill

- **National reflexes.**
  Governments—central, provincial, or self-appointed—announce **export bans** on grain, fuel, fertilizer, and drugs via decrees indistinguishable from forgeries. Ports comply because guns and insurers agree: nothing moves.

- **Strategic stockpiles go dark.**
  Emergency reserves become **uncountable**: seals and meters lie; manifests multiply. Custodians sit on tanks and silos for "national security." Releases are rumored, staged, or seized.

- **Charterers vanish.**
  Shipowners refuse fixtures without trusted letters of credit; banks refuse letters without trusted signatures. AIS tracks show anchored fleets waiting on orders that cannot be authenticated. Crews fear boarding at lawless ports.

- **Container paralysis.**
  Reefers die on the quay; export empties are trapped inland; import boxes can't clear customs that no longer distinguish legitimate declarations. Yard density crosses thresholds where movement itself becomes impossible.

- **Air cargo mirage.**
  Attempts to leapfrog seaports hit counterfeit airway bills, fabricated hazmat declarations, and forged security clearances. Slots are sold twice; handlers walk off; tarmacs stack with perishables under dead chillers.

- **Hoarding as policy.**
  Ministries and militias alike sit on grain and diesel as **war chests**. Release buys allegiance; scarcity buys obedience. Price signals are irrelevant; the trade is **silence for access**.

7.3 Black markets dominate staples; violent arbitrage

- **Aftermarkets by night.**
  When official lines close, trade resumes in alleys and warehouse shadows. Prices are shouted, not posted; weights are negotiated at knifepoint. Payment is mixed: cash, scrip, jewelry, favors, future promises enforced by threat.

- **Gatekeepers monetize movement.**
  Checkpoints become exchanges. A driver "sells" a portion of cargo to pass; a guard "invests" in a load by granting safe conduct; both expect to collect at the next barrier. The corridor itself is a chain of toll booths extracting the margin.

- **Staple stratification.**
  The poor buy adulterated staples in teaspoons; the connected buy clean goods in bulk. Infant formula, insulin, and antibiotics are auctioned in whispers. Counterfeits flood: sugar as salt, saline as antibiotic, pressed chalk as tablets.

- **Arbitrage by force.**
  Rumors of surplus draw raids: markets are cleared by gunfire, convoys redirected, warehouses reflagged under new seals. "Price discovery" is the spread between what a faction can seize and what it must surrender to hold ground.

- **Currency ecology.**
  Cash trades at discounts that vary by block and hour; foreign notes command a premium where they buy passage. Commodity IOUs circulate with issuer-specific haircuts. A day later, the haircut is different; a week later, the issuer is dead.

- **Violence as clearing mechanism.**
  Disputes settle in blood, not courts. A murdered wholesaler resets local inventories; a burned market resets bargaining power. Each fire redraws the graph of who trades with whom.

By this stage, “economy” describes flows under duress, not voluntary exchange. The cryptography collapse unthreads money’s memory; war and scarcity replace it with muscle and proximity. What counts as payment is whatever the holder of the next gate recognizes—today. Tomorrow belongs to whoever seizes the lane before dawn.

8) Information Ecology in a Cryptography Collapse

When signatures, timestamps, and provenance fail, information reverts to **performance and proximity**. Speech that once derived authority from cryptographic proofs now competes on volume, repetition, and muscle. The channel is the crowd; the checksum is the gun at the gate.

8.1 Rumor supersedes news; deepfake leadership and false mobilizations

- **Authority without anchor.**
  Newsrooms, ministries, and emergency ops centers cannot prove authorship or sequence. Feeds that once carried signed alerts now look identical to forgeries; editorial silence (to avoid being weaponized) reads as confirmation of catastrophe. Rumor fills the vacuum because it is **cheap, local, and responsive**.

- **Synthetic leaders.**
  Convincing deepfakes—voice, video, “handwritten” PDFs—announce curfews, evacuations, currency swaps, and surrenders. Each clip is internally consistent, bears perfect seals, and is rebroadcast by partisans who benefit from the order. Real leaders are forced off-air, and their denials are dismissed as fakes of a different faction.

- **Mobilization by counterfeit.**
  “All men 16–60 report to Gate 4 at dawn,” “Healthcare workers to Stadium B,” “Merchants deliver rice to Depot 12”—each instruction self-selects the obedient and exposes them to conscription, extortion, or ambush. Absence becomes guilt; presence becomes leverage.

- **Fragmented realities.**
  Neighborhoods adopt their own “truth loops”: a few radios, a loudhailer, and a popular preacher or sergeant. Beyond earshot, the world is a rumor. Cross-border narratives diverge within a single city block.

8.2 Panic cascades via radio and word-of-mouth; vigilante "verification"

- **Radio as accelerant.**
  With data networks untrusted, FM/AM, CB, and handhelds become primary. Unvetted "situation reports" hop frequencies: poisoned wells, enemy columns, food arrivals. Each relay strips context and adds urgency; listeners act on **the secondhand imperative**, not the fact.

- **Queue dynamics and stampedes.**
  A single broadcast of "flour at School 12" moves thousands; when the gate is shut or the stock is fake, fights cascade into looting elsewhere. Panic begets panic as crowds seek any line that **looks** like it's moving.

- **Street-court fact-checking.**
  Without forensic anchors, groups improvise "verification": demand a caller repeat a local nursery rhyme, name a neighborhood elder, or display a body scar. These shibboleths catch outsiders, not liars. False positives become beatings; false negatives become openings for attackers.

- **Rumor entrepreneurs.**
  Fixers, racketeers, and militia press officers run **information arbitrage**: seed a rumor, move goods ahead of the crowd, then sell "exclusive truth" for a fee. "Insider channels" proliferate and splinter hourly; each claims to be the last honest feed.

- **Silence interpreted as signal.**
  A hospital that stops broadcasting is "overrun." A bank that says nothing is "broke." A convoy that misses its window is "stolen." Absences create narratives that provoke reprisals before facts arrive—if they ever do.

8.3 Scapegoating, pogrom risk, retaliatory myths

- **Target templates.**
  Historic cleavages—ethnic, sectarian, political, professional—supply ready-made villains. "Saboteurs," "hoarders," "spies," "traitor medics," "fifth column truckers." Deepfaked confessions and doctored ledgers circulate to certify blame.

- **Trigger conditions.**
  Three ingredients commonly align: (1) acute shortage (water, bread, fuel); (2) a vivid rumor with a name and address; (3) a mobilizer with loudspeaker, stamp, and men. The result is a **flash pogrom**—minutes from spark to blood.

- **Retaliatory myth-making.**
  After a killing, stories crystallize to justify it: the victim "confessed," "was caught with stamps," "had enemy radio." These legends harden into **micro-histories** printed on broadsides and taught at checkpoints; they recruit, discipline, and inoculate against remorse.
- **Memory edits as weapons.**
  Lists of the missing, casualty tallies, and "official" chronicles are cloned, redacted, and reissued by every faction. Families carry dueling papers for the same dead. Grief is privatized; statistics are militarized.
- **Spatial propagation.**
  Violence travels along rumor corridors—markets, water points, bus depots. Neighborhoods learn to read the weather of hate: certain songs, painted symbols, or a sudden absence of women in the street. By the time an external denial arrives, the crowd has already moved.

In a cryptography collapse, information stops adjudicating conflict and starts manufacturing it. The only stable signals are bodies, smoke, and who holds the corner; everything else is a performative claim competing for the next hour's obedience.

9) Critical Infrastructure Attrition Curves

By Weeks 3–12, failure is no longer episodic. Assets die faster than they can be inspected, let alone repaired. Curves turn sigmoid or exponential in the wrong direction: slow at first, then a steep slide, then a flatline at a degraded "new normal." The **cryptography collapse** keeps provenance and telemetry untrustworthy, so operators default to caution (leave it off) while predators default to extraction (strip it).

9.1 Transformers, pumps, relays lost to misoperation/theft

- **Protection trips → cold iron.**
  Without trusted SCADA and event histories, a single ambiguous relay trip retires an entire feeder. Dispatchers refuse reclose commands that might cascade into a regional blackout. Each "unknown" adds one point to the dead asset curve.
- **Thermal overstress and fouling.**
  Irregular loading and contaminated cooling (blocked radiators, dirty oil) push distribution

transformers past design margins. Bushings track; gaskets leak; dissolved-gas analysis is skipped or forged. Failure rate rises from baseline ppm/year to visible daily losses in dense districts.

- **Pump trains stall into scrap.**
  Intake and high-service pumps run off-sequence or dry due to false level signals; seals burn, bearings pit, alignment drifts. Spare seal kits and bearings were “just-in-time”; now they are never. Crews cannibalize B to keep A spinning, converting two marginal units into one weak one.

- **Relay ecosystems fragment.**
  Mixed vintages and ad hoc settings (printed from unverifiable files) create protection deserts: zones where faults persist too long or trip too broadly. Either way, operators de-energize.

- **Theft and scavenging.**
  Grounding copper, control wire, even transformer oil get stripped. Substation fences are cut; kiosks pried. Each theft is a forced outage; each outage invites the next theft. The curve steepens as absence breeds vulnerability.

- **Rule of thirds (descriptive).**
  By 6–8 weeks in hard-hit metros: ~1/3 of distribution transformers carry load intermittently, ~1/3 are dark but intact, ~1/3 are functionally lost (faulted, stripped, or frightened offline).

9.2 Rail and port throughput collapse; spares exhausted

- **Throughput math breaks.**
  Ports and railheads depend on synchronized choreography (cranes, yard tractors, gate systems). With forged work orders and disputed waybills, every move requires an argument. Moves per crane-hour drop from tens to single digits; trains per day fall below the threshold needed to clear arrivals.

- **Stack height becomes destiny.**
  Containers pile beyond designed rows; aisles vanish; reefers lose plugs; chassis are trapped under boxes with no verified consignee. Yard density crosses a point where each additional box reduces the chance of moving any box.

- **Locomotive attrition.**
  Deferred maintenance and wrong parts (counterfeit or mis-specified) sideline engines. Traction motors overheat under stop-start abuse; air-brake faults sideline consists;

certified inspectors are absent or forged. The active fleet shrinks faster than schedules can be redrawn.

- **Cranes and RTGs freeze.**
  A single counterfeit firmware "update" bricks a yard crane; fear of repeats idles the rest. Spare hoist ropes, spreader bars, inverter boards, and hydraulic seals were global-sourced; export bans and seized convoys end replenishment.

- **Spares curve hits zero.**
  Common wear parts deplete first (filters, belts, hoses), then critical uniques (breaker cartridges, tap changers, PLC cards). Substitute parts appear from gray markets; failure rates jump; warranty and certification are meaningless words.

- **Operational steady state (degraded).**
  Even with labor and will, the system plateaus at a fraction of design capacity: a port that once did 10k TEU/day settles at 1–2k, mostly humanitarian or political cargo; a rail corridor designed for 50 trains/day limps at 5–10.

9.3 Permanence of loss: cannibalization closes recovery paths

- **Cannibalization trap.**
  Managers strip idle assets to keep "priority" nodes alive—control cards from one substation, impellers from a standby pump, panels from a mothballed crane. The donor list grows; each donor becomes irrecoverable without a full rebuild that no longer exists.

- **Skills extinction.**
  Retirement, flight, and targeted killings remove niche maintainers (relay techs, winder specialists, riggers). Apprenticeships collapse; paper manuals can't replace tacit knowledge. Even if parts reappear, hands to fit them do not.

- **Configuration amnesia.**
  Drawings and settings files proliferate in contradictory versions; EEPROMs with the "last good" config were wiped or flashed by counterfeit tools. Recommissioning requires a known baseline that cannot be proven. Assets remain dark to avoid unsafe energization.

- **Asset reclassification.**
  "Outage" becomes "abandonment." Operators redraw maps: dead feeders erased; pressure zones merged; sidings written off. Service deserts harden into **never zones**.

- **Path dependence locks in.**
  Once a district adapts to generators, tanker trucks, and private wells, political pressure

to restore centralized service fades. Informal providers arm, tax, and lobby. The central network loses both customer load and right-of-way access—recovery becomes a political fight, not a technical project.

- **Irreversibility markers.**
  When transformers are drained and cut; when pump houses are stripped to shells; when quay rails are torch-cut for scrap; when right-of-way is blocked by settlement—those lines on the map no longer represent infrastructure. They are **historical artifacts**.

These attrition curves define the long tail of the cryptography collapse: not the first blackout, but the moment when equipment, spares, configuration, and skills fall below the threshold for recovery. Past that point, “repair” is a rebuild campaign measured in years—if politics, capital, and people remain to attempt it.

10) International Dynamics Amid Cryptography Collapse

The **cryptography collapse** does not stop at borders; it dissolves them. Diplomatic identity, treaty instruments, customs clearance, and financial rails all relied on signatures and timestamps. With provenance erased, international order becomes a contest of proximity, convoy control, and camera optics.

10.1 Aid convoys blocked or seized; recognition games

- **Clearance without credence.**
  Aid agencies arrive at crossings with manifests, letters of guarantee, and end-use certificates that look perfect—and are indistinguishable from counterfeits. Border forces default to **hold**. Perishables rot in buffer zones; tempers become policy.
- **Gatekeepers monetize mercy.**
  Passage is sold by the kilometer: escorts, “inspection fees,” off-loading “for safety,” and “temporary storage” that becomes permanent. Local commanders issue receipts stamped with crests borrowed from a prior state; donors file them as proof; none are contestable.
- **Optics as currency.**
  Factions stage televised handovers: pallets passed with flags in frame, clergy blessing the scene, children front-row. The footage substitutes for paperwork; the faction claims recognition; donors accept the photo as a deliverable.

- **Competing interlocutors.**
  Three “ministries of health” demand consignee status for the same shipment. Agencies split cargo to all three to move *something*; each faction declares victory and accuses the others of theft. In effect, recognition is **parcelized**: you are “government” for whatever convoy your men escorted.

- **Humanitarian neutrality eroded.**
  Without secure channels, an agency’s brand can be cloned to mask arms, recruitment, or extortion. Real agencies are blamed for the clones; escorts retaliate against the brand. Neutral badges lose protective value and become targets of opportunity.

10.2 Proxy conflicts intensify; piracy returns; sanctions moot

- **Plausible deniability becomes infinite.**
  Arms shipments, drone strikes, and sabotage carry signatures that can be forged at will. States speak through “deniable” auxiliaries whose provenance is algorithmically undecidable. Escalation proceeds under a fog that cannot lift.

- **Proxy appetites grow.**
  Sponsors pay with fuel, grain, and vaccines rather than bank transfers that no longer settle. Auxiliaries fight for **material subsistence** and corridor control; ideology is a veneer.

- **Piracy’s rational return.**
  Maritime insurers withdraw; port states cannot authenticate bills of lading; naval patrols receive spoofed orders. Littoral groups finance themselves by boarding, ransoming, and siphoning cargoes. Flags of convenience become flags of **whoever** is painted last.

- **Air and cyber privateering.**
  Airstrips under factional control extract landing fees and cargo skims; “airport authorities” proliferate with forged ICAO-style stamps. In the airwaves, spectrum becomes prize: broadcasters hijack frequencies and sell access; satellite uplinks are spoofed; “privateers” publish bounties for captured terminals.

- **Sanctions without rails.**
  Traditional sanctions depend on traceable finance and customs records. With both broken, enforcement reverts to **physical interdiction**. Blockades and seizures replace blacklists; the target adapts with smaller, faster, and more violent routes.

- **Commodity wars.**
  Grain, fertilizer, diesel, chlorine precursors, medical APIs—each becomes a strategic

weapon. Export bans trigger mirror bans; “strategic reserves” are held for leverage. Price is replaced by **possession**; norms by **naval guns**.

10.3 Population movements redraw de facto borders

- **Outflow along surviving corridors.**
  People move where trucks still move and radios still reach. Rivers, pipelines, and highways become **refuge channels** as well as smuggling lanes. Each choke point accumulates those who cannot pay the next toll.
- **Border regimes as filters.**
  Neighboring states (or provinces) improvise triage: skill-based admission, demographic quotas, or camp externalization. Decisions are stamped, copied, and forged within hours; admission becomes a lottery of queue position, bribe size, and accent.
- **Camp cities as political facts.**
  Stadium camps and roadside towns harden into urban form—markets, militias, and municipal committees with their own seals. Host states insist they are temporary; a year later, they vote with feet and checkpoints. Maps acquire **settlement halos** larger than the towns they surround.
- **Ethnic and sectarian sorting.**
  Rumor-driven fear pushes minorities across lines that later become borders. “Protective” relocations crystallize into **purified** districts. Claims of ancestral land and spontaneous occupation produce layered title conflicts that no court can resolve.
- **Labor as passport.**
  Regions short of linemen, pump operators, and drivers exchange visas for service. Work brigades cross in uniform; their families follow; the host issues scrip; the home faction calls them traitors. Population pyramids tilt toward those with scarce skills; hinterlands empty.
- **Border by behavior.**
  De facto lines are set by which radio nets you can use, which ration books get honored, and which convoy safe words you know. Cartography catches up months later, when a ceasefire names what behavior already enforced.

International order, once notarized by cryptography, is replaced by recognition-by-convoy and law-by-checkpoint. The players are whoever can move aid without losing it, police a quay

without spoofed orders, and keep a corridor open long enough for a second trip. Borders shift where the muscle memory of movement says they do; legitimacy accrues to those who can make a truck arrive twice.

11) Humanitarian Metrics of Decline (Descriptive, Not Prescriptive)

These metrics are **thermometers**, not solutions. They reduce chaos to numbers that signal how fast conditions are deteriorating under a **cryptography collapse**. Collection is manual: clipboards, tally sticks, container counts, visual sampling. Precision is less important than **direction** and **velocity**.

11.1 Liters of safe water per capita per day

- **Reference bands (per person/day)**
    - **≥15 L**: stressed but survivable urban baseline (drinking, minimal cooking/hygiene).
    - **8–14 L**: **rationed**; hygiene collapses first (skin/eye infections rise).
    - **4–7 L**: **critical**; diarrhea deaths surge, water sharing triggers conflict.
    - **<4 L**: **catastrophic**; expect mass movement toward any functioning tap.
- **Field proxies**
    - Bucket counts at communal taps; tanker volumes ÷ headcount at queue; chlorine residual spot tests; container observation (jerrycan reuse, open vs. closed).
- **Trajectory cues**
    - Days with **zero** distribution; rising time-to-fill; switch from covered to open storage; sale of containers as income (users giving up on supply).

11.2 Calorie deficits and wasting; bread riots

- **Daily energy access**
    - **~2,100 kcal**: maintenance for mixed populations; below this, deficits accrue.
    - **1,400–2,000 kcal**: **shortfall**; weight loss, fatigue, skipped adult meals.

- **<1,400 kcal**: **famine trajectory**; theft, foraging, transactional sex increase.

- **Anthropometrics (spot checks)**
  - **Global Acute Malnutrition (GAM)** prevalence (6–59 months):
    - **<10%**: serious; **10–14.9%**: alarming; **≥15%**: emergency.
  - **MUAC** < 115 mm (6–59 months): severe acute malnutrition.

- **Market/queue signals**
  - Bread sold by **half-loaf/handful**; flour adulteration; infants fed tea/sugar water; lines policed with batons; queue-to-riot conversion when stock runs out before the front third.

- **Ration composition drift**
  - Oil disappears first, then pulses, then protein. When rations are **starch-only** for >7–10 days, expect edema and rapid SAM spikes in toddlers.

11.3 Excess mortality bands (trauma, sepsis, dialysis, NICU)

- **Crude Death Rate (CDR)** (deaths / 10,000 people / day)
  - **<0.5**: stressed; **0.5–1.0**: emergency onset; **>1.0**: acute crisis; **>2.0**: catastrophic.

- **Cause-pattern inflections**
  - **Trauma:** night-time assaults, generator fires, traffic without signals; rising exsanguination pre-hospital.
  - **Sepsis:** dirty deliveries, wound infections, untreated pneumonia/UTIs; antibiotic stock-outs convert survivable infections to fatalities.
  - **Dialysis:** missed sessions → pulmonary edema/hyperkalemia deaths; count "left against advice" due to fuel/curfew.
  - **NICU:** incubator outages, no surfactant/CPAP, formula dilution; spike in neonatal mortality within 48–72 hours of power failures.

- **Operational markers**
  - Morgue overcapacity; body bags reused; "home deaths" increase; burial tasking to untrained volunteers; death certification replaced by handwritten slips (duplicate, inconsistent).

11.4 Burial delays and secondary disease

- **Time-to-burial (median)**
    - **<24 h**: controlled; **24–72 h**: strain; **>72 h**: public-health hazard and violence trigger (families demand priority).
- **Backlog indicators**
    - Graves left open; refrigerated storage off-line; hearses repurposed or seized; improvised mass graves; body-handling without gloves/chlorine.
- **Secondary disease linkages**
    - **Water/soil contamination:** shallow or floodplain graves → **enteric outbreaks** downstream.
    - **Vector bloom:** bodies + waste piles → flies/rodents → **typhus, leptospirosis**.
    - **Respiratory spikes:** crowding at wakes/queues + smoke from trash fires → **ARI surges**.
- **Conflict externalities**
    - Procession ambushes; sectarian burial restrictions; ransom for body release; forged death notices used to dispossess survivors.

Reading the dashboard: When water <7 L, calories <1,500, CDR >1/10,000/day, and burials >72 h, you are in a runaway regime: expect camp formation, opportunistic violence at taps and bakeries, and sustained excess mortality even if convoys resume. The numbers will improve only if flows (not announcements) change in the streets you can walk.

12) Year-One Equilibria

By the end of the first year, the **cryptography collapse** has finished its conversion of acute crisis into stable scarcity. What persists are not emergency conditions but **settlements of power**—local arrangements that reproduce themselves without outside verification.

12.1 Islanded city-states and rural enclaves

- **Urban archipelagos.**
  Metros fracture into defended districts wrapped around utilities, markets, crossings, and depots. Each district—hospital zone, port ward, water-plant crescent—behaves like a **city-state**: it levies tolls, stamps passes, runs kitchens, and negotiates corridors with neighbors. Perimeters are physical (barriers, fires, cleared sightlines) and informational (radio nets, call-and-response codewords).

- **Governance by utility.**
  Whoever keeps the pump spinning or the substation warm governs. Technical crews become political cadres; their security details become ministries. Elections are applause at ration lines; recall is a gate closed in the night.

- **Rural inversion.**
  Hinterlands select for **enclaves**: villages anchored by a mill, aquifer, or hydro spur, with watch rotations and seed stockpiles. Roads beyond patrol radius revert to ambush country; trade shifts to caravans that move with seasons and festivals.

- **Frontiers harden.**
  The liminal spaces—industrial belts, highways, rail verges—turn into buffer strips patrolled by mixed forces. Maps show municipal borders; life obeys **island edges**: where streetlights end, where the last armed volunteer stands.

- **Diplomacy by convoy.**
  "Foreign relations" between islands are measured in convoys completed. A five-trip history equals recognition; a burned truck equals casus belli. Treaties are laminated route cards with stamps collected at gates.

12.2 Parallel currencies anchored to food, fuel, force

- **Tri-standard money.**
  A typical settlement runs **three monies** in parallel:

  1. **Food-backed scrip** (redeemable for staple rations on a schedule);
  2. **Fuel chits** (liters at a named depot, often serialized metal tokens or embossed paper);
  3. **Force credit** (protection/escort IOUs redeemable in safe passage or priority at checkpoints).
     Exchange rates float hourly and differ by gate.

- **Cash as passport, not unit of account.**
  Domestic notes buy **permission** more than goods; foreign notes buy distance. Gold and jewelry clear inter-island trades where trust is thin; weights and acids return to market stalls.

- **Balance sheets of violence.**
  "Creditworthiness" is a faction's capacity to hold a corridor tomorrow. When a militia loses a bridge, its scrip haircuts widen instantly; when it secures a water plant, haircuts narrow. Traders read **weapon posture** like bond spreads.

- **Price discovery by rumor.**
  Boards are performative; reality is whispered. Spreads reflect tolls paid, bribes due, and risk of confiscation. Insulin trades in secrets, wheat in daylight, diesel under escorts.

- **Arbitrage ecology.**
  Couriers move **information as commodity**: today's exchange between Depot 3 diesel and Market 7 rice. Profits are captured in mixed bundles—half in food, a quarter in fuel, the rest in favors documented by stamped slips and remembered faces.

12.3 Institutional amnesia and new paper sovereignties

- **Records replaced by rosters.**
  Deeds, registries, diplomas, and medical charts exist as mutually inconsistent sets. Operational life runs on **rosters**: who showed at muster, who drew rations, who kept the generator alive last night. A name on a roster is status; absence erases history.

- **Paper reborn as ritual.**
  Stamps, embossers, and wet signatures become **sacraments**. Every office—militia HQ, parish hall, port shack—issues documents with pageantry: ribbons, colored inks, serial plates. Their authority is local and decays with distance like a radio signal.

- **Courts of memory.**
  Disputes resolve before councils of people who remember yesterday: quartermasters, midwives, foremen, pastors. Evidence is testimonial plus tokens (a broken seal, a spent chit). Precedent is the stack of prior slips tied with string.

- **Constitutions as notice boards.**
  "Founding documents" are one-page broadsides listing curfew hours, toll rates, ration entitlements, and offenses. They change when someone pastes a new sheet over the old one. Compliance is enforced by whoever controls the corner.

- **Borders drawn by paperwork gravity.**
  A **paper sovereignty** is wherever a stamp circulates uncontested: a ration book honored across three wards, a pass recognized at four gates, a clinic card accepted by two kitchens. Over time these acceptance clusters merge into de facto states—awkward shapes mirroring convoy routes.
- **Archival loss as policy.**
  Powerholders purge or "reinterpret" old ledgers to erase debts and enemies. Families curate private archives—photos, receipts, letters—as counter-state memory. History bifurcates into **official ritual** and **kitchen-table truth**, each reproducible, neither provable.

At Year One, equilibrium does not mean peace; it means repeatable transactions under force and scarcity. City-states trade by convoy; enclaves farm behind watches; currencies clear against calories and diesel; sovereignty is stamped, not signed. What used to live in databases now lives in habits, routes, and the weight of a seal pressed into rough paper.

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These sources ground the quantitative bands (e.g., water/day, CMR thresholds), sector mechanics (ICS, blackstart, port congestion), camp dynamics, and the information-environment failure modes referenced throughout the manuscript.